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ABSTRACT
        Many aspects of computer managed instruction (CMI)
are discussed in this paper which focuses on the use of computer
technology to support teachers in their efforts to provide effective
instruction. The nature of instructional management is explained and
links to microcomputer capabilities are established. Microcomputer
hardware and software characteristics are presented as they relate
specifically to instructional management applications. The
information presented is designed to help teachers get started in the
use of microcomputers to support their instructional programs.
Finally, profiles of seven diverse CMI programs provide a glimpse of
microcomputer-based CMI concepts in practice. This paper emphasizes
generalized CMI systems, i.e., those not tied to a particular
curriculum content or computer assisted instruction program. A
glossary and a list of CMI resources with addresses are included.
(LMM)

IMPROVING INSTRUCTIONAL MANAGEMENT

WITH MICROCOMPUTERS

by

Ronald M. Smith

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IMPROVING INSTRUCTIONAL MANAGEMENT WITH MICROCOMPUTERS

by Ronald M. Smith with technical assistance from Don Holznagel

OVERVIEW

There are many educational uses of computer technology. Computers can deliver instruction to students (computer assisted instruction) and support school administrators in areas like attendance and accounting. They may be the subject of instruction (computer literacy) or may support teachers in their efforts to provide effective instruction (computer managed instruction). It is the last of these uses that is the subject of this paper. And, in the area of instructional management applications, the focus will be on the use of microcomputer technology, exclusively.

In the sections that follow, many aspects of computer managed instruction (CMI) will be examined. The nature of instructional management will be explored and links to microcomputer capabilities established. Microcomputer **hardware** (terms in bold type are defined in the glossary) and **software** characteristics will be presented as they relate specifically to instructional management applications. Information will be presented that is designed to help you get started in the use of computers to support your instructional programs. Finally, profiles of seven diverse CMI programs will provide a glimpse of microcomputer based CMI concepts in practice.

Throughout, the emphasis will be on generalized CMI systems, those not tied to a particular curriculum content or computer assisted instruction program.

1 COMPUTER MANAGED INSTRUCTION

How the Computer Can Help

Computers can be used to benefit in all kinds of instructional programs, but are especially useful, even a necessity, in highly personalized programs. There are at least four features of computers that make them useful in instructional management applications.

- Speed of calculation and retrieval of information

- Accuracy and reliability in carrying out operations

- Capacity to maintain a large number of detailed records in an organized fashion

- Capacity to do repetitive tasks endlessly

These features give meaning to the concept of computer power. The computer extends the capabilities of teachers and others to manage instruction effectively.

Strictly speaking, the term "computer managed instruction" is a bit of a misnomer in the context presented in this paper. The computer does not manage instruction in the systems to be described here. Rather, *it supports the teacher in several ways that contribute to effective instructional management*. It is a support tool, part of a larger instructional management process.

The beneficial features of computers, described above, apply to computers of any size. However, microcomputers, the smallest members of the computer family, have some additional characteristics which offer benefits for instructional management applications.

- **Compact**. Microcomputers and their storage and printing devices are small and lightweight, and can easily be placed in a classroom or school office near the point of use.

- **Graphics and Color**. Microcomputers offer facilities to easily produce graphic displays of information, including color. This provides for improved communication of statistical and other data, especially at a summary level.

- **Interactive**. The computer languages most commonly used on micros provide the opportunity to produce **programs** which allow almost **conversational interaction** between the computer program and the user.

- **Low Cost**. Microcomputers are relatively inexpensive and have low operating costs.

The advantages of microcomputers suggested by these characteristics are that they are affordable, can be easily placed where they are to be used and can be under the complete control of the user for work scheduling and problem resolution. Furthermore, programs can be simple to use, have a high degree of interaction and display information in communicative and meaningful ways.

Along with the advantages, however, comes the responsibility for things traditionally handled by computer center staff such as maintenance, trouble shooting, problem resolution and data security. Work scheduling control and convenience also accrue only if a micro is dedicated to one application area such as instructional management, avoiding use for a variety of applications.

The Benefits of CMI for Teaching and Learning

Computer power, especially as expressed in the microcomputer, can improve instructional management. It can help teachers and others make better—more accurate, timely and learner responsive—decisions. The overall effect of the computer, if imbedded in an effective instructional program, should be better student achievement. The potential is great.

Dimensions of Instructional Management

While instruction has many dimensions, management is surely one of the most important. *Instructional management is the process that controls the content, context, duration and pace of instructional events.* Its purpose is to promote thorough, efficient learning. Teachers manage instruction as one of their major responsibilities, and so do parents and students at various times. Teachers, parents and students all must make decisions that affect individual educational programs.

In the instructional management process, there are many decision points. Many choices must be made day to day to maintain the momentum of instruction and learning. Good decisions require information that is accurate, specifically targeted, timely and accessible. Instructional management

systems arrange to collect, manipulate and disseminate the information needed by a variety of decision makers.

However, not all instructional programs are alike, either in terms of complexity or information needs. Instructional management is more difficult in some programs than in others. Here are two contrasting examples.

Example 1—Time Based Classroom Instruction

Most secondary instruction takes place in the context of a course, a period of time defined by a grading period. The instructional cycle in a course is usually linked to the length of the grading period used in the school.

At the start of the course some general goals may be stated. More often than not, no explicit outcomes are presented. What follows is likely to be a series of units designed to teach the content of the course. Each course segment will contain classroom activities and some periodic or daily assignments, which are corrected and the scores recorded. At the end of a unit, a test is developed, administered, scored and the score recorded. At the end of a grading period, a grade is prepared and a report card completed. The cycle comes to an end.

In the period of a nine or ten week course, many instructional management tasks must be completed. However, the decision making problem is relatively straightforward. Information is collected, stored and summarized so that a decision about a grade can be made at the end of the marking period. The goals, materials, sequence of activities, student groupings and tests are largely pre-planned for the group. Many decision problems are avoided in whole group classrooms. But, often, opportunities to promote thorough learning are also missed.

Example 2—Mastery Based Classroom Instruction

A relatively new approach to instruction called mastery learning works like this. The content of a course of study is divided into units, each with objectives, activities and tests. Units typically last two or three weeks. The unit defines the length of one instructional cycle. At the start of a course, a pretest may be administered to determine a starting point in the curriculum. At the beginning of the first unit the objectives are introduced and initial instruction is provided. There will be classroom activities and assignments just as in regular courses.

At the end of the initial instruction phase, a test is given to determine whether the desired learning has taken place. The test is scored, but

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> not used for grading purposes. Instead, the test data are used to group students according to mastery of the objectives. Those who have mastered them receive an enrichment prescription. Those who haven't, receive a corrective (remedial) prescription. The non-mastery group is retaught. The teacher corrects the work of all groups and provides feedback.
>
> When the enrichment/correction phase is complete, another test is given to assess mastery for summative (grading) purposes. The test is scored and a unit grade is developed. Often a report for students and parents is prepared and distributed. That ends the two or three week instructional cycle.

As should be clear, the second example involves a more complex instructional process. It is probably more intense because of the shorter cycle and has greater information needs because of the increased number of decision points. It is a harder process to manage. But it does have the advantage of being more responsive to individual progress, thus promoting high achievement.

The examples just presented are only two on a continuum of instructional processes ranging from those with relatively low responsiveness to individual differences to those with high responsiveness.

In general, *the more reponsive instruction is to individual students and the shorter the instructional cycle, the more difficult and complex instructional management becomes.* Often, effective, responsive instructional programs strain or exceed the capabilities of manual instructional mangement systems. In these kinds of programs, the computer may be an essential support tool.

Types of Instructional Management Functions

Instructional programs include a variety of common management functions, areas in which decisions must be made. Some of these are discussed below.

1. **Assigning learning objectives.** Many instructional programs are based on goals and objectives, and the number of such programs is increasing all the time. Objectives may be assigned to groups or individuals. They may be linked to short segments of instruction, like lessons, or to larger segments, like courses. There may be graduation or grade level competencies. Whatever the configuration, the goals and objectives must be well managed to be useful.

2. **Grouping students for instruction.** Students are grouped at various times according to achievement levels and interest. Placing students in courses or classes, scheduling, is the most common form of grouping. Grouping within classes is becoming more common. The time intervals for grouping and regrouping vary considerably across programs. Grouping decisions, especially those involving achievement level, are sometimes difficult. Having the best possible information at the right time helps minimize the chance of misassignment.

3. **Prescribing instruction.** Assignments are matched by teachers to groups and individuals. In addition to content, assignments vary in length and level of difficulty. Types of materials and activities prescribed may vary widely, even when addressing the same topic. Good instructional prescriptions match both the objectives of the lesson and the cognitive characteristics of the learner.

4. **Testing.** Prior to instruction, there is often a need to know a student's level of achievement. This information is needed to decide on objectives (diagnosis) and to plan learning activities (prescription). Assessment is the method of getting needed information. Assessment involves several management tasks. The assessment instrument, often a test, must be developed, perhaps using items from an item bank. The intent is to get a test that perfectly matches the lesson objective and the instruction. The test must be presented to the student in some form, perhaps on paper, or orally or perhaps through the video display unit of a microcomputer. Once the student has reponded to the items, they must be scored and the scores summarized some way.

5. **Recording progress.** Teachers accumulate many kinds of information about students: test scores, observational data, the products of daily assignments. These bits of information about performance are the basis for many kinds of decisions. Consequently, classroom information needs a form of organization that facilitates decision making.

6. **Reporting performance.** To support good decisions, information must be reported selectively and in a systematic way to teachers, parents and students. A common way to share information is through the letter grade-based report card. A complimentary approach is to develop performance profiles for individuals that link objectives to performance levels such as mastery criteria. Information must be managed—retrieved and summarized—so that reports are accurate representations of learning.

7. **Reviewing program effectiveness.** There is increasing emphasis on the review of instructional programs based on student performance data. The goal is to continuously improve the effectiveness of classroom instruction. To achieve this end, teachers need various kinds of summary data about student progress. Achievement data may be analyzed statistically and compared with objectives. Group performance relative to test items may be examined to spot poor items or areas where instruction needs improvement. In this function, teachers manage the quality of instruction, a tough but important task.

Figure 1 summarizes all the instructional management functions just presented.

Figure 1
Instructional Management Functions

1. Assigning learning objectives
   - Long range planning
   - Instructional outcomes

2. Grouping students for instruction
   - Scheduling
   - Within class

3. Prescribing instruction
   - Materials
   - Activities

4. Testing
   - Generation
   - Delivery
   - Scoring

5. Recording progress
   - Test scores
   - Observational data
   - Daily assignments

6. Reporting performance
   - Grade reports
   - Performance profiles

7. Reviewing program effectiveness
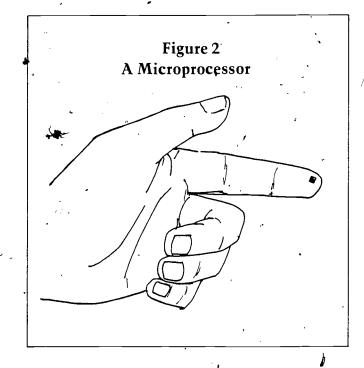   - Group data analysis
   - Test item analysis

MICROCOMPUTER SYSTEMS FOR INSTRUCTIONAL MANAGEMENT

Anatomy of a Microcomputer System

A microcomputer is a type of computer based on a microprocessor, a small square (chip) of silicon, a quarter inch or less on a side, on which has been etched tens of thousands of logical circuits and storage locations. (A microprocessor is shown in Figure 2.) This chip is the working part of the micro, where the "computing" goes on. In addition to the microprocessor, or central processing unit (CPU), the microcomputer also includes the circuitry needed to input and output data.

A microcomputer system consists of the microcomputer plus other devices (peripherals) that manipulate information and allow the user to control the microprocessor. A typical array of hardware used in CMI applications is shown in Figure 3.

Figure 2
A Microprocessor

Figure 3
Typical CMI Hardware

Video Display (CRT)

Disk Drive

Keyboard

Central Processing Unit

Printer

Card Reader

Here is what the various parts of the system do.

- **Central Processing Unit**—processes data according to program specifications.

- **Keyboard**—allows information to be input and programs to be selected and controlled.

- **Video Display (CRT)**—a television set or monitor that allows the user to review information in memory, observe results and interact with programs in conjunction with the keyboard.

- **Disk Drive**—a device used to store and retrieve information from a storage medium, usually a 5¼" floppy disk.

- **Printer**—translates electronic signals into typed copy.

- **Card Reader**—device for the automatic entry of data coded on cards.

All the pieces of the system work together to carry out the functions that support the teacher's overall instructional management plan.

5

Hardware Requirements for CMI

Perhaps the most critical feature of CMI systems from a hardware point of view is the need for large amounts of storage or **memory**. CMI systems often contain information about many aspects of instruction, from lists of objectives to test items. And, of course, there is a file for each student managed within the system. Each collection of related information is called a data base. Figure 4 presents some of the more common of these as used in microcomputer based CMI systems.

Figure 4

Common CMI Data Bases

- *Objectives*
- *Curriculum Structure*
- *Resources (materials and activities)*
- *Test items*
- *Student information*
- *Teacher information*

The number and size of the data bases usually leads to a **modular** approach when developing and running programs on a microcomputer. Each instructional management function is independent of the others and uses only the data base information needed to carry out the function. This approach leads to linear processing rather than the simultaneous processing common with larger computers. Normally this approach creates few problems, but does result in slower processing rates.

Microcomputers used for CMI usually have minimum **primary memory** size of 32k. 48k is common. Because of the large amount of information typical of CMI systems, **secondary memory**, usually in the form of floppy disks, is needed to store information and programs not in use at any given time. From the point of view of disk storage (5¼" installations), the following very general rules apply in terms of total system capacity.

- With little disk switching and a CMI program of medium complexity, about 100 students can be maintained.

- With much disk switching and a CMI program of medium complexity, up to 1,000 students can be maintained.

Generally, less disk switching is better than more disk switching. Loading and unloading disks frequently can lead to a variety of errors and equipment problems.

More secondary (disk) memory can be obtained in a number of ways, all of which cost more money (e.g., larger disks, hard disks). However, storage disk technology is advancing rapidly and significant,

affordable improvements in storage capabilities can be expected in the near future.

Alternative Ways to Organize a Micro Based System for CMI

Almost all current implementations of micro based CMI are at the building level. The most typical arrangement includes one microcomputer housed in a central location, operated by a trained aide. Data are transported to the "center" on mark sense sheets, cards or via written codes on standardized forms. The aide controls all data entry and report generation. Multiple use of hardware is common, although equipment dedicated to CMI use probably results in fewer problems.

Other possible arrangements include:

- A central (within building) CPU with **networked terminals** distributed at key locations. Such a system may rely more heavily on teachers than aides for data entry and retrieval.

- **Intelligent terminals** (micros) networked with larger computers at remote locations.

- Micros decentralized with each teacher participating in the CMI system housing and using a micro in his/her own classroom. This configuration increases the possibility that students could take a larger role in managing their own instruction.

CMI Software

Software refers to computer programs, which are sequences of instructions which cause a computer to carry out desired functions. Some programs (system software) control and coordinate the various hardware components of a computer. Other programs (application software) contain the procedures for carrying out functions for a specific need such as instructional management. The software, documents and procedures necessary for an application are called a package or system.

Good criteria for the development of CMI programs are not yet well specified. There are very few commercially available packages for CMI. Some of the available ones are described in the Profiles section that follows. As already mentioned, CMI packages tend to be modular due to storage limitation. Commercial systems may or may not have a data base structure well suited to your instructional management process.

One characteristic that seems to be emerging as *a key indicator of quality is the interactive nature of the program*. The best programs seem to be **menu-driven** with built-in **error traps** and many **prompts** presented to the user. Quality programs seem to require little use of paper **documentation**. Good programs are easy to use.

There are at least three ways to get the kind of CMI program you need:

- Hire a programmer and have a custom program written to match your instructional program.

- Buy a commercially available program, use what you want and adapt your instructional process to the program.

- Buy a commercially available program, hire a programmer and have the program modified to meet your needs.

All three approaches appear to work, with the critical variables related to success being time, money and programming competence.

GETTING STARTED WITH CMI

First Steps

Often the first step in planning for CMI has nothing to do with computers at all. Before spending time looking at computer hardware and software, spend some time, perhaps a good bit of time, looking at your instructional program.

Basically, you will need to decide what kind of instructional program you want and then set about organizing it in a very systematic way. Here are some ideas about this process.

- Decide on the level of implementation you want. Do you want CMI in just a couple of classrooms, in a department, in a building or implemented across a whole district?

- Once you have decided on the scope of your effort, do an instructional "audit." Carefully describe how instruction is carried out, what kinds of management decisions teachers make and what kinds of information they collect and use.

- Use the audit information to initiate dialogue among those who will participate in the CMI system concerning the need for some common instructional processes. Focus on developing a common instructional model.

- Carry out curriculum/instructional development that is needed to get a unified instructional approach.

- Once the instructional process is developed, analyze it carefully in terms of the ways that computers can help. Doing this generates the specifications for the CMI system that will meet your needs. It helps ensure that the dog wags the tail, not vice versa.

- For the best possible implementaion, your instructional program should be aligned perfectly with the capabilities of your CMI system.

Planning Strategies

If you have an instructional improvement process in place, use it to plan and implement your CMI system. If you don't, one alternative might be to give your CMI effort status as a special development project. You can then apply fairly standard project planning strategies, including the development of methods for disseminating the project once it is completed.

Of course, a key principle is to involve those who will use the CMI system in planning and developing it. *Without user ownership, implementation will be difficult.*

Some other ideas include the following:

- Some schools have found that a task force with a knowledgeable leader and the use of outside resources is an effective approach.

- Identify your immediate CMI needs, but keep an eye on the future. A flexible CMI system can better meet changing needs. The long-term view needs adequate weight in planning.

- As has been noted before, staff awareness concerning computer technology will probably be an early and continuing inservice concern. An adequate knowledge foundation must be established before much development can be carried out.

- Start small. At least as a general rule. Use short, intermediate and long-range goals to pace your efforts. Plan to expand as you gain experience at each level of implementation.

Ways to Get the Expertise You Need

If you have a computer whiz on staff, you are lucky. Most people don't. But knowledge about hardware, software and instructional applications is absolutely essential. How can you get the expertise needed? Here are some ideas:

- Hire an outside consultant.

- Train a person who is already in your district or building.

- Team consultants and internal staff on a long-term basis to get the development done and to train your staff.

- Collaborate with a vendor or with university personnel.

- Form a consortium with other school districts and share ideas and combine resources.

One or more of these ideas may be used to build the capacity you will need to successfully implement a CMI system.

Cost Analysis for CMI

The real cost of a CMI system lies beyond hardware and software. The following list gives a sample of some of the factors to consider.

- Hardware

- Software

- Expendables like printer paper and diskettes

- Hardware maintenance

- Operator's salary and benefits

- Facilities costs including space and utilities

- Consultant costs for problem solving

- Manager's salary and benefits

- Staff training

Consideration of these and, perhaps, other factors, as well, will help you budget realistically for implementation.

COMPUTER MANAGED INSTRUCTION: PROFILES OF SUCCESSFUL PROGRAMS

In this section, profiles of successful CMI programs are presented. Based on extensive research, it seems as though the programs described here are representative of the kinds of efforts going on across the country. By way of introduction to the sites, you may wish to study Figure 5 below.

Figure 5

CMI Site Characteristics

CMI Site	District Size	Context	Students in CMI	Grade Levels	Program Area Where Used	Software Source
Wrangell, AK	467	Rural	467	K-12	General	Commercial/Local
Los Gatos. CA	3,900	Urban	3,900	9-12	Graduation Competencies	Commercial
Houston, TX	190,000	Urban	9.000	6-12	Reading	Commercial
Lake Stevens; WA	3.003	Suburban/Rural	500	1-8	Basic Skills	Commercial
Duluth. MN	15,214	Suburban	2,100	7-12	Basic Skills	Local
Dallas. OR	2,622	Rural	450	7-8	General	Local
Portland, OR	53,856	Urban	500	4-8	Title I	Commercial

Geographic Isolation Overcome as Teachers Bring Computer Power to Wrangell, Alaska

Wrangell is a small town isolated on an island in a remote section of southeastern Alaska. The setting seems unlikely for successful CMI implementation. Yet committed teachers have brought computer power to their educational programs and, as a result, are managing instruction more effectively.

After a 1980 visit to a CMI project site in Hopkins, Minnesota, four teachers led a local development effort supported by Title IV-C and II-B grants. Their first initiative involved the implementation of a CMI program call C.A.M. (Comprehensive Achievement Monitoring) originally developed in Hopkins.

C.A.M. works this way. For each course, a set of objectives is developed or located. Test items are then prepared for each objective creating an item bank for the course. The item bank allows test forms covering a broad range of course objectives to be developed. Each test form is called a "mini-final" because it covers content across the whole course.

At the start of a course, the teacher administers the first of the C.A.M. tests. Since none of the objectives have been taught, this first test serves as a pre-test for all course content. Subsequently, C.A.M. tests are administered at two to four week intervals. In these later administrations some items form a pre-test (items related to objectives not yet taught), some form a post-test (items related to objectives taught since the last C.A.M. test), and the remaining items form a retention test (items related to objectives taught in the past). Tests can be customized to the needs of the teacher who may select the objectives to be tested and request a specific number of test items per objective.

Information from C.A.M. tests is intended to help teachers decide what content to emphasize and what to cover quickly, when students need remedial help or when they need re-teaching on important concepts or skills they have forgotten. C.A.M. test information also may help students manage their own learning more effectively.

C.A.M. is used in both of the school buildings in Wrangell. In each school, one a high school and the other an elementary, space has been set aside for an "Evaluation Center." Each school has an aide who makes most of the computer entries, maintains the test item bank, compiles tests and generates most of the reports and records produced by the C.A.M. program. The coordinator, Kathy Wayne, teaches elementary classes in the morning and works in the high school evaluation center in the afternoon. Each center is equipped with a microcomputer and printer. The high school center also has a card reader that allows automatic data entry and scoring of C.A.M. tests.

Several types of reports can be generated, including the following.

- Student coupon—These are reports to students and parents prepared and distributed after each test administration. A coupon shows the objectives tested, whether the student's answer to the test item was correct or incorrect and whether instruction on the objectives had been given. The total score for the test is given as the ratio between the number right and the number possible (e.g. 21/26). A cumulative list of scores of all C.A.M. tests taken is also supplied.

- Class report—A report for the teacher that shows summarized performance for each student for each test administration.

- Objective report—This report, for teachers, shows group performance on each objective tested for each test administration.

- Test evaluation report—Again, a report for teachers. This one provides an item analysis for each test item in a test form.

C.A.M. is being applied in several subject matter areas. In the elementary school, use is concentrated in courses teaching language and study skills. In the high school, C.A.M. is being used in English, Biology and Algebra courses. Hardware, C.A.M. software, expendable materials, and aide's salary ($7.22 @

C.A.M. student coupon showing test results

hour) for one school year for each building cost approximately $16,000. Operating costs in subsequent years should be in the range of $10,000-$11,000 per year.

In addition to the C.A.M. program, Wrangell teachers, led by the programming efforts of teacher Richard Port, have implemented another CMI program called HI. Port customized an existing program to meet the needs of Wrangell teachers for a grade recording system. The HI "electronic grade book" keeps track of assignments, grades and grade averages.

Students receive a bi-monthly printout which shows current grade average and lists all assignments to date with the grade for each. Teachers receive 1) an alphabetical list of students with current averages, 2) a ranked list of students and averages, and 3) a list of assignments to date with a class average for each.

HI is being used in grades 4-12 in a variety of subject matter areas such as math, English, government and typing. Evaluation center staff carry out data entry as do classroom teachers because of the program's input simplicity.

Most inservice work for both C.A.M. and HI implementations was completed by district staff. A C.A.M. specialist from Hopkins was brought in for one workshop. Members of the teaching staff have contributed many hours of their own time to secure successful implementation.

Future work in the CMI area will focus on refining procedures for the use of the C.A.M. and HI programs and extending their use to additional courses and grade level programs.

Despite severe constraints, computer managed instruction works in Wrangell. All of the district's nearly 500 students in grades K-12 have benefited from computer support.

system brief

Hardware

General description of
system . . . . Apple II+; keyboard and
CPU in one unit

Central processing unit . . 6502, DOS 3.3 with 48K
RAM

Peripherals
· disk drive . . . . Apple dual disk
monitor . . . . : . . . . . Amdek 100G, 11"
printer . . . . . . , ... Paper Tiger
numeric keypad . . . . . . Advanced Business
Technology
card reader . . . . Chatsworth MR 500
graphics tablet . . . . Apple

Software

Programming language . . Integer Basic

Program source . . . . C.A.M.: Evaluation
Center,
Hopkins Public Schools
1001 Highway 7
Hopkins, MN 55343
(612) 933-9230

reports

Reports produced	Audience	How used
1. Individual student coupon	Student/ parent	Testing feedback
2. Class report	Teacher	Group monitoring
3. Objective report	Teacher	Program review
4. Test evaluation report	Teacher	Program review
5. Student coupon	Student/ parent	Grading feedback
6. Cumulative group averages (alphabetical)	Teacher	Group monitoring
7. Cumulative group averages (rank order)	Teacher	Group monitoring
8. Assignment list	Teacher	Program review

Contact Person: Kathy Wayne or Joan Eagle
Wrangell City School District,
Box 651
Wrangell, Alaska 99929
(907) 874-3745/874-3397

* total of eight Apple II+ micros in use in the district

Los Gatos High School Competencies Program Made More Manageable Through Use of a Microcomputer

High schools in Los Gatos, California, like many other high schools across the United States, require students to demonstrate competence in several basic skill areas as a prerequisite to graduation. In Los Gatos, nearly 4,000 students must be tested, tracked and remediated as necessary, as they move toward completion of the graduation competencies requirement. Los Gatos educators find manual testing and record keeping systems cumbersome, both slow and prone to error. Existing district computer services were judged inadequate also. Enter the microcomputer.

Eleven graduation competencies in math, reading and writing were identified. Tests were then developed to assess proficiency in each area. The first assessment takes place in ninth grade. There are four subtests, one for math (3 competencies), one for reading (4 competencies) and two for writing (4 competencies). Each subtest takes about one hour to complete, though there are no strict time limits imposed. Tests are given in English and social studies classes and require about four class periods. The math and reading subtests are multiple choice while the writing tests are performance assessments, holistically scored.

Students must pass each objective. Those students with deficiencies must take makeup tests offered three times a year (November, February, April) in grades 10, 11 and 12. Makeup assessments include one test per objective. Students take only those test segments needed. Makeups are administered on Saturdays and require preregistration. When students take a reading or math test, they respond on mark-sense answer sheets. These are then fed through a card reader that automatically scores the test and enters or updates a report in each student's computer file. Writing scores are entered manually via the keyboard using a pass/fail code.

Information stored in the computer is manipulated several ways to produce reports useful to students, teachers and other decision makers. Reports include those describing progress of individuals (non-mastered competencies, status of all competencies, results from all test administrations) and those describing progress of groups (class/grade status, school status, list of all students not mastering a specific competency). Of particular interest are the statistically oriented school status reports which are useful to administrators in program review and revision efforts.

The microcomputer is housed at the district's central office and operated by a technical aide. The system is used intermittently, with heaviest use around test administration dates. Reports are dispersed by the district's mail service on a request basis. There are two large, comprehensive high schools and one small continuation high school. Administrators and counselors are the primary system users.

The program run on the computer was purchased from the Evans-Newton Company, a firm which has developed and markets a generalized CMI program called *PROJECT BASIC*. Los Gatos purchased the *PROJECT BASIC* package and then paid approximately $400 additional for custom programming to meet needs specific to the graduation competencies program.

Microcomputer hardware used in Los Gatos cost approximately $3,000 with the PROJECT BASIC software package costing $1,950. Operating costs, including salary for a part-time clerk, are expected to run in the neighborhood of $6,500 for the next year.

Inservice training for teachers focused on interpretation of computer generated reports. Additional inservice for administrators and clerks focused on system operation.

Competency reports target students needing additional instruction

Implemented in mid-1981, Los Gatos' CMI project will concentrate the first full year's effort on smoothing out procedures and solving any technical problems that may arise. Early evidence suggests that the microcomputer is going to make an important contribution to the effective management of the graduation competencies program.

system brief

Hardware

General description of
system . . . . Commodore CBM 2001;
keyboard, CPU, monitor
in one unit

Central processing unit. . 6502, 32K RAM

Peripherals
disk drive . . . . Commodore 4040 dual
disk drive
monitor . . . . Commodore, integrated
printer. . . . . Commodore 2002
card reader . . . . Chatsworth MR 500,
modified for optical scan

Software

Programming language . . Commodore Basic
(Microsoft derivative)

Program source . . . . Evans Newton, Inc.
7745 East Redfield Road
Scottsdale, AZ 85260
(602) 998-2777

reports

Reports produced	Audience	How used
1. Non-mastered competencies	Student/ parent	Counselling
2. Student report card	Student/ parent	Monitoring
3. Student history	Student/ parent	Monitoring
4. Grade/class status	Teacher	Planning, prescribing
5. School status report	Adminis- trators	Program review
6. Non-proficient students listed by competency	Teachers/ counsellors	Planning, remediation

Contact Person: Donald R. Brand, Director of
Competency Testing
Los Gatos Joint Union High School
District
P.O. Box 1257
Los Gatos, California 95030
(408) 354-2520

CMI Profile

Reading Achievement Target of CMI Application in Houston, Texas

For the Houston, Texas, Independent School District, the use of microcomputers for instructional management purposes is a natural extension of the district's long-standing involvement in the area of computer technology. Following a review of district reading programs in middle, junior high and senior high schools, a decision was made to bring in microcomputers to support instructional management.

The content and structure of the reading program, which is lab based, were modified in an effort to increase the effectiveness of instruction. In Houston, there are 17 reading objectives replicated at different levels of complexity at each of three curric-

ulum levels in the reading program. Each curriculum level focuses on building specific skills and uses materials matched to the functional reading levels of enrolled students. At all levels, the content of the materials is matched to the age level interests of the participants. The curriculum levels correspond roughly to the following grade level equivalents.

• Level 1—grade 3-4 instructional level

• Level 2—grade 4-5 instructional level

• Level 3—grade 6-7 instructional level

At each level, objectives are divided into groups of two or three which form a unit of instruction. These units or "clusters" form the basis for a classroom instructional cycle. Each cycle lasts two weeks and includes intense, direct instruction and practice on cluster objectives. At the end of a cycle, a cluster test is given to determine if students have mastered the objectives. Students move step-by-step through

a sequenced set of clusters designed to build needed reading skills.

To be eligible for the reading program, students must be two or more years below grade level in reading achievement. The program is for students in grades six through twelve.

Student placement in the program is determined by an annual test. For high school students (grades 9-12), performance on the reading section of the Houston Minimum Competency Test is used for placement decisions. This test is given in the eighth grade and repeated periodically, as needed, thereafter.

For those in middle and junior high school (grades 6-8), placement is based on a pre-competency test which focuses on reading only. Each grade level has its own version of the test. The microcomputer is used to score pre-competency tests and to record results.

Students are scheduled into labs for a semester at a time. At the end of each semester, progress is reviewed. Students may be placed in another sequence in the same level, advanced to a higher level or scheduled out of the lab program, if reading performance is satisfactory.

The microcomputer is used to provide support to the lab teacher in tracking and reporting student progress, as well as in making placement decisions. Diagnostic and cluster test information is main-tained for each student and referenced to level placement and objectives mastery. Computer generated reports include individual student profiles, student report cards and class summaries which teachers can use for instructional planning.

Begun in the fall of 1981, the reading program has been implemented at 57 middle, junior high and senior high schools in the district. About 9,000 students participate in the program.

At each campus, there are typically two or three reading labs. Each lab teacher has four or five sections. All the labs at a campus are served by one microcomputer housed in a center. The micro is run by an aide who inputs data and generates reports as requested by lab teachers.

The CMI software was supplied by Evans-Newton, Incorporated (ENI). The program is called PROJECT BASIC and costs about $2,000 per implementation. The program is generalized and adaptable to most curriculum structures and many instructional processes.

Inservice training, both for classroom teachers and micro operators, was supplied by district personnel, who, in turn, were supported by training from ENI.

Houston is using microcomputers to help teachers spend more time providing instruction and less time managing it.

system brief

Hardware

General description of
system . . . . Bell and Howell version
of Apple II+; keyboard
and CPU in one unit

Central processing unit. . 6502, DOS 3.3 with 48K
RAM

Peripherals
   disk drive . . . . Apple, dual disk
   monitor . . . . Sonya, 9"
   printer. . . . . Mannesmann Tally or
                   Paper Tiger, IDS
   card reader . . . . Chatsworth

Software

Programming language . . Basic (Applesoft)

Program source . . . . Evans Newton, Inc.
7745 East Redfield Road
Scottsdale, AZ 85260
(602) 998-2777

reports

Reports produced	Audience	How used
1. Diagnostic test results	Teacher/ counselor	Placement
2. Objective test results	Teacher	Monitoring
3. Student report card	Student/ parent	Monitoring
4. Class status report	Teacher	Planning

Contact Person: Ronnie Veselka, Assistant
Superintendent
Research, Evaluation and
Accreditation

Mike Mauldin, Associate Director
Institutional Research
Houston Independent School
District
3830 Richmond
Houston, Texas 77027
(713) 623-5226

Lake Stevens Basic Skills CMI Project

Better information about student progress will help teachers deliver instruction, tailored to individual needs, more effectively. On this premise, the Lake Stevens School District has implemented a CMI system in an instructional improvement effort. Using a Title II basic skills grant, the district purchased a microcomputer and installed a CMI program (MICRO-CMI) developed by Don McIsaac and others at the University of Wisconsin, Madison. Development efforts during the two-year project (1980-82) are focused on instructional management in reading, language arts and mathematics in first through fifth grade.

Five key teachers, one at each grade level, in one elementary school (Hillcrest Elementary) have been actively involved in customizing and field testing the CMI system. They are part of a CMI task force which includes the Title II project director, the district curriculum director, the principal, librarian and secretary at Hillcrest, and a basic skills aide responsible for operating the microcomputer. The computer is housed in Hillcrest's instructional media center (IMC).

During the 1980-81 school year, emphasis was placed on the reading curriculum (Houghton-Mifflin). Learning objectives and roster information are entered as prerequisites to the "electronic grade book" function of the microcomputer. Here is how the system works.

Progress tests are distributed throughout the curriculum and occur frequently. After a test is administered, a teacher hand scores it and assigns either an "M" for mastery, if at least 80% of the items for an objective are correct, or writes down the raw or percentile scores (e.g., 65%) if the score is less than 80%.

Grade information is sent to the computer center where the basic skills aide enters it on the computer. Once test information is on the machine, several types of reports can be generated for individuals and groups showing progress through the curriculum.

Teachers also have the option of certifying student performance using non-formal assessment or personal judgment. The code "MC" is used to denote those objectives certified in this way.

Typical elapsed time between receipt of task information in the computer center and production of performace reports is a half day.

Performance reports show what has been learned and what hasn't. Teachers use computer generated reports to group students, to identify those needing remediation and to prescribe learning activities that are neither redundant nor too difficult.

During the 1981-82 school year, emphasis will be placed on the development of a math management system and making better use of grouping information. Additional development will focus on integrating learning styles information into the student information data base. More teachers will be participating in the project. The grade range involved in the project will be extended to eighth grade.
Here are some other points of interest.

- The software used at Lake Stevens is not tied to a specific curriculum package. Any curriculum, if formatted to data entry requirements, can be used.

- The capacity of the system is large, having been designed to manage as many as 1,000 students.

- The software is menu based for easy operator use; the use of prompts and fail safes reduces the chance of data loss.

The computer automatically generates grouping reports

- The microcomputer is connected via telephone to the software developer's home base in Wisconsin; the entire Lake Stevens' program can be run remotely for problem solving purposes.

- Other functions, such as automatic prescription of learning activities and instructional grouping are built into the software and available on demand; the computer is also sophisticated enough to run administrative programs in such areas as attendance and word processing.

Information on the effectiveness of the project will not be available until the end of the 1981-82 school year.

Hardware, software and installation cost the District just under $20,000. 1980-81 costs for the half-time operator, the maintenance/service contract and expendable materials was approximately $7,000. During the 1980-81 school year, members of the task force participated in an inservice workshop involving two half-days of release time and two evening sessions each month.

system brief

Hardware

General description of
system . . . . General Robotics, RT-11 Microcomputer, keyboard separate, CPU and monitor integrated in single housing·

Central processing unit . . KD11-HA, 32K RAM

Peripherals
disk drive . . . . 2-GRC disk drives
monitor . . . . GRC, integral
printer . . . . IDS 440 Paper Tiger
scanner/card reader . . . . #5098 DMR data terminal

Software

Programming language . . Fortran

Program source . . . . University of Wisconsin Research and Development Center, Madison, WI, Donald McIssac, Principal Developer (608) 263-2718

reports

Reports produced	Audience	How used
1. Individual achievement profile	Teacher	Remediation
2. Individual performance profile	Teacher	Remediation
3. Multiple performance profile by classroom	Teacher	Grouping

Contact Person: Wayne Robertson, Director of Special Programs
Lake Stevens School District No. 4
12708 - 20th Street, N.E.
Lake Stevens, WA 98258
206/334-0441

CMI Profile

CMI Supports Basic Skills Development in Duluth, Minnesota Secondary Schools

Reading and math, two fundamental skill areas, receive special attention in two Duluth, Minnesota secondary schools. CMI is a key feature of a basic skills program intended to ensure that students develop needed proficiences.

Washington Junior High and Central High School participate in the program, developed under a Title IV-C grant and implemented in 1978. Called the *Basic Skills Development Design*, the program includes criterion referenced testing, ability grouping and a tracking system that allows skill development to be followed across classes and grade levels.

Using an objectives scope and sequence in reading and math, Duluth staff developed minimum proficiency tests for each subject, units of instruction keyed to objectives and a computer based recordkeeping system.

The computer program used in the project was developed locally under the direction of Donna Mark. A programmer was hired to write a custom program tailored to defined information needs. Initial development costs were in the range of $1,500 to $2,000.

At first, the computer program was run on a mainframe computer at a site some 150 miles distant using a remote terminal housed in the high school. This time-sharing approach soon proved too costly leading project managers to seek a less costly alternative. A microcomputer, housed on site, was selected. Additional programming was done to implement the recordkeeping program on the micro.

The basic skills program works like this. Students are tested at the end of sixth grade using a criterion-referenced proficiency test. The results are entered into the computer then used in parent conferences and as the basis for placement in basic skills classes in junior high. When deficiencies are found, students are assigned to classes where skills defined in the objectives scope and sequence are specifically taught. The results of criterion-referenced unit tests (post tests) also become part of each student's data file maintained in the computer.

At the end of ninth grade, students are tested again. Records are updated and new placements made. Instruction in the minimum skill areas continues as needed.

Computer generated records are used for placement, for diagnosis in basic skills classrooms, as a source of planning information for regular classroom teachers and as a mechanism for communication with parents. Counselors, teachers and parents can request reports at any time. Basic skills information provided by the system is used not only for remediation purposes but also for making advanced placement decisions.

The microcomputer is housed at the high school.


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                                    CLASS NUMBER:22222
ID-NO   NAME      READING TEACHER  MATH TEACHER  READ  MATH   CON VOU STR URD SEN SEL SEQ MAP GPH MATH MATH
                                                 DATE  DATE           ANL MNG MNG                  COMP U+D
101234            STREITZ          RAPP          9/79  8/79   100  98  47  50  38  38  50  30  50   72   65
                                                       6/80                                             17   67
102345            ANDERSON         OLIN          9/79  9/79    87  80  73  50  13  38  23  30  30   87   80
                                                 9/80  /       74  78  67  93  74  67  42  93 100
103454            COHEN            ZBASHIK       5/79  5/79    87  73  67  50 100  85  75  80  90   80   87
                                                 /     /
104789            MCNAMARA         MELANDER      5/79  5/79    67  67  78  82  66  66  78  87  90   88   83
                                                 5/80  /      100 100  93 100  87  87 100
109574            LAUTERBACH       JACOBSON      5/80  5/80   100 100  87 100  63  82  75  80  90   90  100
                                                 /     /
104567            AUHAN            BERG          5/80  5/80    93  80  93  75  38 100  75  90  70  100   94
                                                 /     /
101232            BARRY            LAURVICK      5/80  5/30   100  80  60 100  25  50  38  60  60   67   13
                                                 /     /
117873            ANDERSON         ANTONICH      /     8/79                                             13   33
                                                 /     6/80                                             45   67
110767            LOREN            STROMME       5/80  5/80   100  87  47  50  63  63  38  80  80   72   80
                                                 /     /
113333            NYGAARD          NELSON        6/79  9/79   100  87  73  88  38 100  75  60  90   67   44
                                                 /     6/80                                             39   78
117999            TUCKER           CATO          8/79  8/79   100 100  60  75  50  88  50  80  40   80   80
                                                 /     /
117868            SJOGREN          BOULES        5/80  /      100 100 100 100 100  75 100  90 100
                                                 /     /
112559            CARLSON          PETERSON      9/79  9/79    93  67  53  88  50  50  75  30  90   76   47
                                                 /     /
114444            MCKEON           LUNDBERG      4/80  6/80    73  53  53  50  50 100  50  80  80   87   49
                                                 /     /
                              PROFICIENCY TEST RESULTS BY CLASS NO
```

Test results are easily accessible through computer printouts

An aide works about half-time updating records and preparing reports. System use varies across the school year with the greatest effort generally at the start of the year.

The Apple II+ and peripherals cost approximately $4,000. Operating costs for the 81-82 school year should run about $4,500 including aide time. A programer is retained to assist in solving software problems and in developing new capabilities. Hardware support is provided at the district level.

Inservice for those using the system was conducted in faculty meetings with considerable one-to-one followup provided. The project director handled all the training.

Future development will focus on the addition of a card reader for test grading purposes and the development of software to integrate auto scoring into the existing program.

In Duluth, over 2,000 secondary school students benefit from a computer supported basic skills program, developed and operated locally.

system brief

Hardware

General description of system . . . . *Apple II+; keyboard and CPU in one unit*

Central processing unit . . *6502, DOS 3.3 with 48K RAM*

Peripherals
disk drive . . . . *Apple dual disk*
monitor . . . . *RCA black and white*
printer . . . . *Tele-Terminal, Model 143*

Software

Programming language . . *Basic*

Program source . . . . *Locally developed*

reports

Reports produced	Audience	How used
1. Proficiency test results by class	Classroom teachers	Planning
2. Individual student report	Reading/ math teachers	Diagnosis/ Prescription
3. Math and reading information by advisor	Counselors/ advisors	Scheduling
4. Deficiency reports	Counselors/ special education personnel	Scheduling
5. Incomplete or missing scores	Project director	Test administration

Contact Person: *Donna Mark, Project Director*
Secondary Basic Skills Design
Central High School
800 E. Central Entrance
Duluth, Minnesota 55811
(218) 722-6343

A Grassroots Approach to CMI Development Results in Improved Instruction in Dallas, Oregon

Needs at the classroom level and an enterprising teacher have stimulated a grassroots computer supported instructional management effort in Dallas, Oregon. A junior high math teacher, Dick Fobert, supported by key administrators, has spearheaded the district's CMI initiative. Working at first in his own classroom, Dick developed CMI capabilities to better meet the needs of his students. As he successfully demonstrated the computer's potential, other teachers in the junior high became interested, experimented with Dick's programs and eventually applied CMI functions routinely to their own classrooms. The interest in CMI has spread throughout the district resulting in a K-12 pilot project scheduled for the 1981-82 school year.

Work to date has focused on computer support of testing, grading and recordkeeping functions. Fobert has written his own programs or customized commercial programs to meet his needs. By the 80-81 school year, a grading program had been produced and a broader classroom management program was under development.

The grading program is based on a point grading system where point values are assigned for a variety of student activities such as tests, homework and laboratory exercises. Each activity that contributes to the student's grade has a maximum point value. The raw score for each student in each activity is entered in the computer along with the point maximums. Once these data are entered, the computer adds points in each area of student activity (e.g., all tests), computes the percent of points accumulated in relation to the total number possible and produces a letter grade using cutoff scores entered earlier by the teacher. This "electronic grade book" has been used successfully by teachers at several different grade levels and in several different subject matter areas.

Fobert is also working on other applications of the microcomputer for classroom management. As part of the district's graduation requirements, students are expected to attain and demonstrate several competencies. Dick has developed a program that assists teachers in tracking, recording and reporting individual student progress toward completion of required competencies.

The microcomputer has been housed in the media center at a junior high school. Teachers operate the computer independently to complete data entry and related tasks. Fobert is the district's programmer, provides needed staff training and maintains hardware.

Certain features of CMI will change during the 1981-82 school year as the district expands its efforts. The Dallas School district participates in a cooperative research and development group called the Valley Educational Consortium. One of the Consortium's projects, sited at Dallas, will test the feasibility of using microcomputers to manage instruction in a goal-based mathematics program. Approximately twenty math teachers across all grade levels will participate in the pilot project.

Interesting features of the math management project, headed by John Davis and Fobert, include the following:

- Continuation of the electronic grade book functions with the addition of automated test scoring using mark sense test forms and a scanner.

```
                            POBD3

STUDENT      TEST        DAILY        QUIZ        FINAL
   0          39  100 A   212  100 A    24  100 A   100 A
   1          38   97 A   194   91 A    22   91 A    95 A
   2          37   94 A   201   94 A    28   95 A    94 A
   3          35   89 B   212  100 A    23   95 A    91 A
   4          38   97 A   197   92 A    22  100 A    96 A
   5          36   92 A   209   98 A    22   91 A    92 A
   6          37   94 A   206   97 A    23   95 A    94 A
   7          38   97 A   148   66 D    20   83 B    90 A
   8          34   87 B   197   92 A    24  100 A    89 B
   9          36   92 A   199   93 A    20   83 B    90 A
  10          32   82 B   198   89 B    22   91 A    84 B
  11          29   74 C   136   64 D    20   83 B    73 C
  12          33   84 B   190   89 B    22   91 A    85 B
  13          37   94 A   188   88 B    23   95 A    93 A
  14          34   87 B   192   90 A    21   87 B    87 B
  15          36   92 A   199   93 A    23   95 A    92 A
  16          32   82 B   198   93 A    21   87 B    84 B
  17          34   87 B   193   91 A    22   91 A    88 B
  18          31   79 C   162   76 C    23   95 A    80 B
  19          36   92 A   192   90 A    19   79 C    89 B
  20          35   89 B   212  100 A    21   87 B    90 A
  21          36   92 A   131   61 D    21   87 B    86 B
  22           0    0 F   152   71 C    21   87 B    23 F
  23          36   92 A   159   75 C    21   87 B    86 B
  24          33   84 B   182   85 B    22   91 A    85 B
MINIMUM POINTS REQUIRED
AREA          A            B            C            D
TEST          35           31           27           23
DAILY        190          169          148          127
QUIZ          21           19           16           14
```

```
DEAR PARENT / GUARDIAN:

█████████ HAS FAILED TO TURN IN THE ASSIGNMENTS LISTED BELOW

         SCORE/CODE      ASSIGNMENT
            AA           PAGES 24 AND 25 THE EVEN PROBLEMS

DETAILS CONCERNING THESE ASSIGNMENTS ARE AVAILABLE TO █████ DURING CLASS TIME.
```

"Electronic grade book" function makes grading simpler

- A detailed set of student learning goals in mathematics with matching test items which are at the heart of the computer supported teaching/testing process.

- A new word processing program that lets teachers create tests using the microcomputer.

- One microcomputer per building (junior and senior highs) to give teachers easy access to information.

- The availability of an aide to run tests through the scanner housed at the district office. One day turn around is anticipated for test scoring. All other functions handled in local buildings.

- Each teacher will have his/her own floppy disk for maintaining classroom information.

Costs are limited to hardware, expendable supplies and four hours of aide time each week. One TRS-80 Level III and Lineprinter cost approximately $3,100.

With local expertise, strong commitment from key individuals and efficient use of local resources, microcomputers are providing teachers with needed assistance in managing classroom instruction. Grassroots development is yielding good results.

system brief

Hardware

General description of system	*Radio Shack TRS-80 Model III microcomputer; keyboard, CPU, monitor, and disk drive integrated in one unit
Central processing unit	Z-80, 48K RAM
Peripherals	
disk drive	Radio Shack, integral
monitor	Radio Shack, integral
printer	Radio Shack, Lineprinter 6
scanner/card reader	Scantron

Software

Programming language	Basic (TRS-DOS)
Program source	locally programmed, some custom versions of Radio Shack listing programs

reports

Reports produced	Audience	How used
1. Grade printout	Teacher	Completing report cards
2. Area printout (grading components)	Teacher	Checking student progress
3. Competency report	Teacher	Remediation/ placement
4. Performance report	Teacher	Remediation
5. Individual report (grades, competencies)	Teacher	Reporting progress
6. Item analysis report	Teacher	Locating good or bad test items/reviewing group performance

Contact Person: Dick Fobert/John Davis
La Creole Junior High School
701 S.E. LaCreole Drive
Dallas, Oregon 97338
(503) 623-6662

*Several micros in use, all TRS-80, but with varying levels

In Portland, Oregon, Title I Classroom Teachers Use Micros to Support Individual Programs

Five schools in Portland, Oregon, use microcomputers to manage instruction in Title I classrooms, classrooms which serve students in grades 4-8. The micro based management system is part of a comprehensive instructional package, called *Prescription Learning*, which is focused on skill improvement in the areas of reading and mathematics.

The Prescription Learning program, a commercially available laboratory package, uses an objectives-based skill continuum as the basis for organizing a large collection of multi-media learning resources. Test information is used as the basis for matching objectives and resources to individual students. Each student's program is completely individualized, but instruction is delivered in several ways including individual study and teacher-directed, small groups. The intent of the Prescription Learning approach is to get maximum "time on (appropriate) task" for each learner.

The *In-Lab Management System*, one component of the total package, helps the teacher run the classroom effectively and efficiently. The microcomputer, which is at the heart of the System, is housed in the classroom and directly operated by the teacher or aide. Here is how the management component works in the Title I programs at the following schools:

- George Elementary
- Kellogg Middle
- Ockley Green Middle
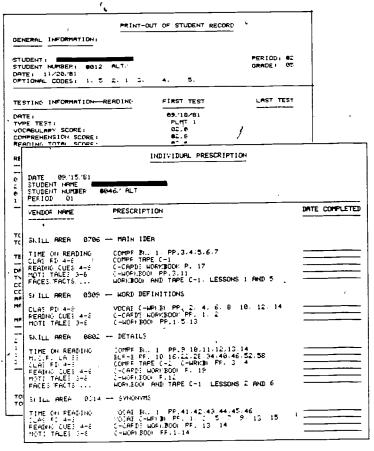- Sellwood Middle
- Whitaker/Columbia Elementary

At the start of the year, each student takes a diagnostic test. Teachers may key student responses into the computer to get a Starter Prescription, a set of sequenced activities related to Lab resources, appropriate to each student. This initial prescription covers approximately the first two weeks of school.

In the interim, the diagnostic test answer sheets are sent back to the vendor's company headquarters where they are processed. The company sends back a set of diskettes which contain the data base information needed to run the management system. They also send back detailed, long-term prescriptions for each student based on the diagnostic test information and the resources avialable in the Lab.

When the teacher receives the diskette system, the complete set of lab management functions can be undertaken. After the initial assistance, the classroom teacher maintains and updates the classroom files as needed.

As students work through their prescriptions, they take short tests designed to check their progress. These "hands-on" tests are delivered via the computer terminal. The student, operating the keyboard, responds to the test items presented by the computer. The items are keyed to the student's prescription. Records are immediately and automatically updated.

The system has provisions for many kinds of reports. There are those for teachers, ranging from individual student profiles to grouping recommendations. There are also reports especially designed for parents that describe student progress and make suggestions about ways parents can help their children learn. There is also a report that provides a list of library books keyed to the reading ability of the student and his/her interests. Finally, there are reports that aid teachers and others in reviewing program effectiveness.

Test data are used to update prescriptions

```
* * * READING SKILL DEPICTION * * *

STUDENT NAME    CROWE         JUNE
STUDENT NUMBER  0046/
DATE   09/15/81

THE DEPICTION BELOW ILLUSTRATES THE RESULTS OF YOUR CHILD'S PERFORMANCE
IN THE LAB.  EACH SKILL IS LISTED TO THE LEFT OF THE PAGE.  THE STATUS
OF THAT SKILL WILL APPEAR UNDER THE "STATUS" HEADING.

DESCRIPTION                               STATUS

ROOT AND BASE WORDS                       IMPROVED
CONTEXT CLUES                             IMPROVED
MAIN IDEA                                 MISSED
SENTENCE ELEMENTS                         MASTERED
USE OF THE DICTIONARY                     MASTERED
COMPOUND WORDS                            IMPROVED
WORD DEFINITIONS                          MISSED
DETAILS                                   MISSED
TYPES OF SENTENCES                        MASTERED
SYLLABICATION                             MASTERED
SYNONYMS                                  MISSED
SEQUENCE                                  N/A
PARTS OF SPEECH                           N/A
USE OF REFERENCE/LIBRARY SKILLS           N/A
DRAWING CONCLUSIONS                       N/A
INFLECTIONAL ENDINGS                      N/A
ANTONYMS                                  N/A
FACT OR OPINION                           N/A
CAPITALIZATION                            N/A
PREFIXES                                  N/A
HOMONYMS                                  N/A
COMPARE AND CONTRAST                      N/A
PUNCTUATION                               N/A
PARTS OF A BOOK                           N/A
CAUSE AND EFFECT                          N/A
SUFFIXES                                  N/A
MULTIPLE MEANINGS                         N/A
EXPRESSIVE LANGUAGE                       N/A
SPELLING                                  N/A
OUTLINING                                 N/A
```

This report helps parents monitor progress toward learning goals

The Prescription Learning Company provides all needed staff development including initial training of three to ten days and periodic follow-up assistance. Prescription Learning also supplies the maintenance needed to keep the Lab, including computer hardware, running smoothly. Hardware, software and expendables are all available through Prescription Learning.

Recently, an enlarged version of the In-Lab Management System has become available for general instructional management use. It is called *Moti Management*. Though implemented on the same hardware as the In-Lab System, Moti Management is more extensive both in terms of storage capacity and the variety of functions and reports available. Some administrative functions, like attendance, have been integrated into the software.

Both the In-Lab Management System and the Moti Management system have the potential for helping teachers have more time for teaching. As exemplified in Portland, computer technology can be used to help students succeed.

system brief

Hardware

General description of
system . . . . Commodore CBM 2001;
keyboard, CPU, monitor
in one unit

Central processing unit. . 6520, 32K RAM

Peripherals
disk drive . . . . Commodore 2040 dual
disk drive
monitor . . . . Commodore integrated
printer. . . . . Commodore, 4022

Software

Programming language. . Basic

Program source . . . . Prescription Learning/

Moti Management
5240 S. 6th St. Road
Springfield, IL 62705
(800) 637-8598

reports

Reports produced	Audience	How used
1. Printout of student record report	Teacher	Monitoring
2. Lab profile	Teacher	Planning
3. Group prescriptions	Teacher	Grouping
4. Exception reports	Teacher	Planning
5. Individual prescription	Student	Classroom activities
6. Skill depiction	Parent	Monitoring
7. Parent prescription	Parent	Home instruction
8. Library book list	Student/ parent	Home instruction
9. Pre-post analysis	Teacher	Program review

Contact Person: Jack Ball, Title I teacher
George Elementary
10000 N. Burr Avenue
Portland, OR 97203
(503) 286-0828

GENERAL OBSERVATIONS

Figure 6 summarizes the management use of the microcomputer across all seven sites. The management functions displayed in the Figure are the same as those discussed in Section 1. The Figure shows the range of actual applications compared with the possible range.

Figure 6
Instructional Management Functions
at the Seven Sites

INSTRUCTIONAL MANAGEMENT FUNCTIONS		Wrangell	Los Gatos	Houston	Lake Stevens	Duluth	Dallas	Portland
1. Assigning Learning Objectives	long range planning				▲			
	instructional outcomes			▲	▲			
2. Grouping Students For Instruction	scheduling			●	▲	●		
	within class				▲	●		●
3. Prescribing Instruction	materials				▲			●
	activities				▲			
4. Testing	generation				▲			●
	delivery							▲
	scoring	1●	●	●	▲		▲	●
5. Recording Progress	test scores	1 2●	●	●	●	●	●	●
	observational data	2●			●		●	
	daily assignments	2●			●		●	
6. Reporting Performance	grade reports	2●			▲		●	
	performance profiles	1●	●	●	●	●	●	●
7. Reviewing Program Effectiveness	group data analysis	1 2●	●	●				●
	test item analysis	1●	●	▲			▲	

key: 1 = C.A.M. program   ● = in use
       2 = HI program   ▲ = potential (available in software)

Several generalizations can be drawn from the profiles presented above which probably apply across most CMI implementations nationwide.

- Most implementations are at the building or classroom level.

- Micros seem to have good potential across all sizes and types of schools.

- The use of micros for instructional management purposes is a new area of computer applications. Most schools are still in the development stage of implementation.

- One barrier to implementation seems to be the lack of computer literacy among professional educators, in general. Greater knowledge of computer characteristics and capabilities among those involved in CMI programs may be a prerequisite for success in the long run.

- A second barrier seems to be the organization of many instructional programs. CMI systems work only in instructional programs where the instructional process has been clearly defined and where the participants agree to use the process uniformly. Obtaining these conditions is sometimes difficult, especially in secondary schools.

- Developing or buying software both have problems associated with them. Software development is a slow process and can be costly. Commercially available software is convenient, but the package rarely includes a program list. You don't get to see the program that runs your sys-

tem. When you buy a commercial program, you don't actually get the program, you get the right to use it. This can be an issue when system problems arise.

- Nationwide, there are relatively few implementations of micro based instructional management systems, especially at the secondary school level.

- Microcomputer hardware is not without its problems, but overall it is proving reliable in onsite applications.

- Without exception, CMI programs currently in operation take only a slice out of the whole range of instructional management functions which could benefit from computer support. Even in the best programs, *there is untapped potential*, areas in which the computer could be applied to further strengthen instruction.

RESOURCES 5

Idea Sharing

If you are working in the area of computer managed instruction, we would like to hear from you. Drop us a line or call toll free, 1-800-547-6339. In the future, we will update the contents of this paper. We would like to include your ideas and experiences.

Commercial CMI Packages

In addition to the commercially available CMI packages discussed in the Profiles section, two other efforts should be noted. Both SRA and Bell & Howell offer learning systems that have CMI components. Both companies have tailored their packages to their own particular objectives and materials. However, their CMI components may be adaptable to more general instructional programs.

Bibliography

Baker, F.B. *Computer Managed Instruction: Theory and Practice.* Englewood Cliffs, N.J.: Educational Technology Publications, 1978.

McIsaac, D.N. and F.B. Baker. "Computer-Managed Instruction System Implementation on a Microcomputer." *Educational Technology*, October, 1981.

Sources of Assistance

Organizations.

Association for Development of Computer-Based Instructional Systems (ADCIS)
ADCIS Headquarters
Computer Center
Western Washington University
Bellingham, WA 98225
Contact: Gordon Hayes, Executive Secretary
(206) 676-2860

Association for Educational Data Systems (AEDS)
1201 16th Street, N.W.
Washington, DC 20036
Contact: Shirley Easterwood, Executive Secretary
(202) 833-4100

International Council for Computers in Education (ICEE)
Department of Computer and Information Science
University of Oregon
Eugene, OR 97403
Contact: David Moursund
(503) 686-4405

Northwest Regional Educational Laboratory Microcomputer Software and Information for Teachers (MicroSIFT)
300 S.W. Sixth Avenue
Portland, OR 97204
Contact: Don Holznagel
(503) 248-6800

Journals/Newsletters/Directories

Classroom Computer News
P.O. Box 266
Cambridge, Massachusetts
$12.00 per year.

The Computing Teacher
Department of Computer and Information Science
University of Oregon
Eugene, Oregon 97403
$14.50 per year, 9 issues

Educational Technology
140 Sylvan Avenue
Englewood Cliffs, New Jersey 07632
$49.00 per year. A monthly journal.

Electronic Education
Suite 220, 1311 Executive Center Drive
Tallahassee, Florida 32301
$10.00 per year, September-June.

Electronic Learning
902 Sylvan Avenue
Englewood Cliffs, New Jersey 07632
$17.00 per year. Published by Scholastic, Inc.

School Microware
Dresden Associates
P.O. Box 246
Dresden, Maine 04342
$20.00 per year. A directory of microcomputer
programs which support teaching and learning.

Microcomputer Directory: Applications in Educational Settings
Monroe C. Gutman Library
Harvard School of Education
Administrative Office
6 Appian Way
Cambridge, Massachusetts 02138
Cost $5.00. A guide to some 250 schools with
microcomputer programs, including alternative
learning environments.

GLOSSARY

Conversational interaction   As the user enters information into the computer through the keyboard, the computer processes the data and gives information back through the video display (monitor). This back and forth exchange of information is called interaction. When the computer processes information quickly, the interaction can be fast or conversational. The user can interact with the computer almost like talking with a person.

Documentation   Documentation is printed material, usually a booklet, that gives instructions for using a computer program.

Error-trap   When the wrong key is pressed by the user, the computer recognizes the error and informs the user, via the monitor, of the mistake. The program does not advance until an appropriate response is made.

Floppy disk   A floppy disk is a soft, plastic disk housed in a square protective case. In most micro applications, a floppy disk measuring 5¼ inches is used. The disk stores information and programs when they are not used on the micro. It is also called a diskette.

Hardware   The physical components that make up a microcomputer system are called the hardware.

Intelligent terminal   Sometimes micros are hooked up with much larger computers. In this arrangement, the micro has access to information and programs stored in the large computer. Actual processing of information is done on the micro, though information or a program may be borrowed from the large computer. In this context, the micro can be considered an intelligent terminal or extension of the large computer.

Memory   A location within a computer system where information or programs are stored.
  Primary Memory   Space inside the microcomputer where information is stored.
  Secondary Memory   Space outside the microcomputer, usually a floppy disk, where information is stored.

Menu-driven   When a user starts through a program, the computer displays a set of options from which the user may choose. In a CMI system, the choices generally relate to instructional management functions. The choices form the menu. Once a choice is made, the computer gives information about the kind of additional data needed to continue running the program.

Modular   From a computer perspective, modular means that a program is broken up into pieces, each piece doing a special job and needing specific kinds of information. CMI programs are almost always broken into modules.

Networked terminals   Sometimes keyboards and other pieces of hardware in separate locations are all wired to a central processing unit. Through the processing unit, the terminals can share information. Often central processing units in this kind of configuration are faster and have more storage than regular micros facilitating efficient processing.

Program   A program is a sequence of instructions which cause the computer to carry out desired functions.

Prompt   A prompt is a message displayed by the computer that helps the user make correct responses to computer requests for information.

Software   Software is a general term referring to any kind of computer program.

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